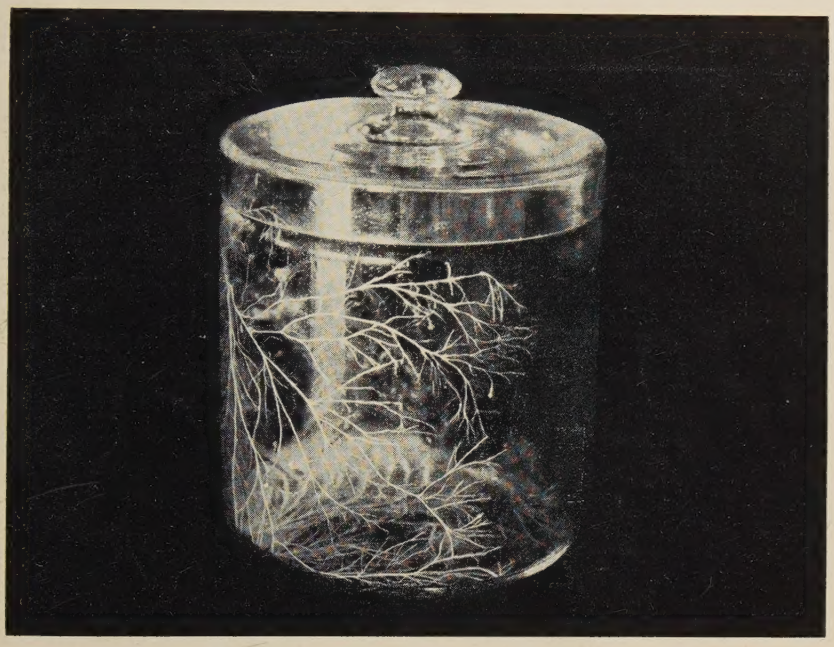
PLANTERS' BULLETIN

OF THE RUBBER RESEARCH INSTITUTE OF MALAYA



NEW SERIES NUMBER TEN

CONTENTS

	Page
Editorial: Progress of Research	1
White Latex Crepe	7
New Class Limits for Technically Classified Rubber	10
Correspondence	12
Root Disease	14
Bale Coating Specifications	20
Notes	11, 13, 24

Price
50 Cents

January
1954

R R I

LOCATION. The Institute's Laboratories and Offices are at the third mile, Ampang Road, Kuala Lumpur.

CORRESPONDENCE. All LETTERS must be addressed to the Director, Rubber Research Institute of Malaya, Post Office Box 150, Kuala Lumpur. Special inquiries may be marked for the attention of a particular officer, if so desired (See Staff List in Bulletin No. 1, page 24). The address for TELEGRAMS is Searching, Kuala Lumpur. TELEPHONE: Kuala Lumpur 3351/2/3. PARCELS occasionally arrive without any indication of their origin. It is requested that senders will write their names and addresses clearly on the outside of all packages, and also advise the Institute by letter or telegram of their despatch. This is especially important for perishables, such as latex samples and plant specimens.

PROHIBITED PLANT SPECIMENS. Attention of planters and others in territories outside the Federation of Malaya and the Colony of Singapore is drawn to the Malayan Plant Importation Rules which prohibit the importation into Malaya of any part of a plant, whether living or dead, unless it is accompanied by a permit issued by the Director of Agriculture, Federation of Malaya. No permit will be issued in respect of any diseased plant or any plant pest. Any plant imported in contravention of these Rules (whose object is to prevent the introduction of diseases or pests) will be destroyed without examination. Anyone outside Malaya who desires our advice on pests or diseases or any other matters that may require examination of living material must first submit an inquiry by letter giving the fullest possible description of their problem.

ADVICE. Inquiries are invited from rubber producers in the Federation of Malaya, the Colonies of Singapore and North Borneo, and the territories of Sarawak, Brunei and Nigeria, who may require more detailed information applicable to their own special problems. INTERVIEWS should be arranged by letter or telephone, as members of the senior research and advisory staff are frequently absent on visits to plantations. The Institute is open from 8 AM to 1 PM and 2 PM to 4 PM on Mondays to Fridays, and from 8 AM to 12.30 PM on Saturdays.

EXPERIMENT STATION AND FACTORY. This station of the R R I is situated 16 miles from Kuala Lumpur, at Sungei Buloh on the Kuala Lumpur — Kepong — Kuala Selangor road. Visits may be made on Mondays or Wednesdays by arrangement with the Director of the Rubber Research Institute (see CORRESPONDENCE above). There is a guest house.

PUBLICATIONS. A list of 'Publications of the R.R.I.' is available on request. Subscription to Planters' Bulletin may be made by depositing $10 with us.

PLANTERS' BULLETIN

OF THE RUBBER RESEARCH INSTITUTE OF MALAYA

Kuala Lumpur January 1954 P. B. 10

Editorial: Progress of Research

With the end of the year 1953, the five years programme of Research and Development financed by the Malayan Rubber Fund from the quarter cent cess on rubber exported from Malaya comes to an end. The plan provided for the work of three principal research, advisory and publicity or development organisations for natural rubber, the Rubber Research Institute in Malaya, the British Rubber Producers' Research Association and the British Rubber Development Board in the United Kingdom.

It is of interest to review briefly the principal aims of the 1949-53 programme. Plans were prepared against a background of changing conditions in the industry, in which the two predominant factors were rising costs of production of natural rubber and post-war consolidation with rapid technical advances in the American synthetic rubber industry. To meet this changed situation it was considered that the natural rubber industry had four principal lines of attack or defence:

i To increase efficiency of production methods and so maintain for natural rubber a strongly competitive position on a cost basis

ii To better the standards of quality by improved methods of preparation and so increase the acceptability of natural rubber to the manufacturer

iii To improve current forms and develop new forms or derivatives of natural rubber capable of competing with rival synthetic products

iv To strive for expansion of present uses of natural rubber and to extend its use to new fields

The R.R.I. is concerned primarily with the problems of the grower; therefore its work falls mainly under (*i*) and (*ii*), but in planning a full programme the Board made provision for close cooperation between the R.R.I. and the organisations working on (*iii*) and (*iv*), *i.e.* the British Rubber Producers' Research Association (B.R.P.R.A.) and the British Rubber Development Board (B.R.D.B.).

It is convenient to divide the R.R.I. field of research for natural rubber into two sections, research on the problems of production and research on the product. Although no hard and fast line can be drawn between them, it will be clear that the R.R.I. has work to do in both sections. Research on production problems is the function of the Soils, Botanical and Pathological Divisions; it includes all problems in selection of land, preparation for planting or replanting, selection and proving of planting material, cultivation and manuring, tapping and collection, pest and disease control, in fact every feature of rubber production up to the point of collection of latex. At this point the Chemical

Division takes over and the chemists, engineers and rubber technologists study means to improve the product, increase its range of uses, and generally endeavour to perfect the forms in which natural rubber is offered to the manufacturer. (This simple division of the research field is not so clearly defined in actual practice, but it affords a convenient basis for organising a working programme and reviewing progress.)

Planned on the basis outlined, the R.R.I. share of the five years programme provided for some expansion of research on production and a considerable expansion of research on the product.

In 1941 the R.R.I. employed 16 senior scientific staff, 12 of whom were engaged on research and advisory work on production, with 4 chemists and technologists working on the product. At the end of 1948, of that pre-war team 6 only remained all of whom were on production research; at the same time the staff had been built up by post-war recruitment to 16 research and advisory officers (7 vacancies were filled in 1948) including two chemists and one chemical engineer.

The R.R.I. Board's development plan provided for increases in the senior research staff from 22 appointments in 1949 (including 16 for production research and 6 for research on the product) to 27 appointments in 1951 (comprising 16 for production research and 11 for research on the product). Progress of recruitment has been slower than planned; in 1951 only 19 posts had been filled, 12 for production research and 7 for research on the product. The full complement was reached during 1953, some eighteen months behind schedule.

Analysis of R.R.I. expenditure over a number of years shows that some 55 per cent of total expediture goes to research and 45 per cent to advisory work to the growers. It is most important that this allocation should be clearly understood in all discussions of expenditure on research. Although a small number of R.R.I. senior scientific staff are engaged practically full time on research the majority are required to divide their time about equally between research and advisory work.

Under the terms of the Malayan Rubber Fund five years plan total allocations to the Board of the R.R.I. amounted, in round figures, to $11.5 million for recurrent expenditure plus $1.7 million for capital development including additional laboratories, housing and extensions on the R.R.I. Experiment Station. Of capital expenditure it would be fair to regard it as providing facilities equally for research and advisory work; therefore we arrive at a total allocation of approximately $7.25 million for research only for the five years 1949 to 1953.

REVIEW OF PROGRESS

The R.R.I. plans to increase the establishment and to provide for additional research, especially on the product, have been fully implemented, though at a slower rate than hoped for when the plans were first submitted for approval in 1948. Apart from unforeseen increases in the cost of capital items, the allocation has been exceeded by some $700,000, the target has been reached within the limits of the income provided by the Malayan Rubber Fund. Moreover, it may be worthwhile to mention that the excess expenditure on capital extensions has been more than offset by payments to the M.R.F. by the Board of the R.R.I. of some $1.4 million being profits on the operation of the R.R.I. Experiment Station.

Apart from the close association between the R.R.I., B.R.P.R.A. and the B.R.D.B., in the general interest of progress in research the Board has followed a policy of cooperation and liaison with other research organisations for natural rubber, by organising meetings and conferences both for producers and scientists working in the industry. The R.R.I. has also initiated closer cooperation between the Rubber Research Institutes in Malaya, Indonesia, Indo China and Ceylon, and valuable liaison has also been established between the Agricultural Research Institute, Belem, Brazil and the Division of Rubber Plant Investigations of the United States Department of Agriculture. In 1952, the R.R.I. assumed direct representation on the International Rubber Research Board and International Rubber Development Committee. Closer relations between the Institute, through its Chemical Division, and the London Advisory Committee for Rubber Research (Ceylon & Malaya) and the British Rubber Producers' Research Association have been achieved by transfers of staff from the U.K. organisations to work at the R.R.I. in Malaya.

For detailed information on these matters and full accounts of progress reference may be made to the general publications of the R.R.I. and to the *Reports* of the principal Divisions. The most important advances in the research work of the R.R.I. are briefly reviewed.

RESEARCH ON PRODUCTION

By the SOILS DIVISION'S systematic surveys, from information gained from long term experiments and from investigations arising in course of advisory work on plantations and smallholdings, a classification of Malayan soils on which rubber is grown has been made. This classification forms a sound basis for general recommendations on cultivation treatment and manuring of rubber on a wide range of Malayan soils both in new planting and replanting. Long term manuring experiments, which are still in progress, are steadily providing essential information on the fertiliser needs of rubber at all stages of its life.

Study of cultivation practices, particularly in regard to management of covers and weed control, has resulted in the development of new and economical field practices based on the use of chemical weed killers. Progress has been made in the mechanisation of methods of cultivation and maintenance and in relation to new planting and replanting.

Fundamental research on the phosphate status of Malayan soils has yielded results of great value in practice; further fundamental study of the nutrition of the rubber tree is already providing information which is urgently needed for the solution of outstanding problems.

Undoubtedly the most effective single means of strengthening the producers' competitive position is to increase yield per acre; therefore breeding and selection of improved rubber planting material has continued to be one of the major lines of work of the BOTANICAL DIVISION. From the mass of new material prepared between 1936 and 1941, a new series of high yielding clones, the RRIM '600' series, has been selected. These clones give full indication of improved performance over the best proved material at present available for large scale planting. They have been established in large scale trials in all parts of the country and are now being offered for general distribution. The

breeding and selection programme has been steadily pursued and has been extended by the inclusion of new 'blood' in the form of other hevea species and new types of *H. brasiliensis* introduced, through strict quarantine, from tropical America by liaison with research organisations in the Western Hemisphere. Linked with the breeding and selection work is field research on testing and proving all promising improved planting material to provide reliable evidence for practical application.

The second main line of work, namely, the study of tapping systems, has continued and good progress has been made in determining the value of different systems of tapping, and the use of yield stimulants under special conditions, especially in relation to drastic tapping, prior to replanting.

Fundamental research on the formation of latex in the tree has been resumed, after a long break, with the appointment of adequately qualified research staff.

In the study and control of disease, especially in relation to replanting, new knowledge has been gained by the PATHOLOGICAL DIVISION on the control of root diseases in rubber, and effective methods of reducing the incidence of root disease in replantings have been worked out and applied. The control of mouldy rot, probably one of the most serious causes of loss of crop in Malaya, has been improved by the study and introduction of more effective fungicides and methods of using them. A close watch has been kept on the incidence of leaf diseases, particularly *Oidium;* although up till now this disease, which has caused so much damage in other countries, has not caused serious damage in Malaya. Nevertheless, constant observation must be maintained in case its severity should increase.

The pathologists have also carried out a major investigation of means of combating the very destructive South American leaf disease should it make its appearance in this country. Apart from the introduction of new strains of rubber known to be resistant to the disease, a project undertaken jointly by the botanists and the pathologists, a technique of spraying from the air which may prove effective in checking the development of the disease, should it appear in this country, has been worked out.

Further successful developments are recorded in the preparation and testing of wound dressings for use in cases of accidental or malicious damage. Progress has been made in the control of white ants and other insect and animal pests.

RESEARCH ON THE PRODUCT

It is an ever recurring complaint by rubber manufacturers that one of the principal difficulties encountered in using natural rubber is its variability, and it is claimed that in this respect natural rubber falls behind synthetic GR-S. Natural rubber prepared from latex always contains traces of non-rubber substances. Research has shown that much of the variability in processing of natural rubber may be traced to the presence of the non-rubber substances. Therefore fundamental study of the non-rubber constituents of latex has been one of the most important subjects of research in the CHEMICAL DIVISION. In a brief survey of this

kind it is impossible to go into detail, but it is sufficient to say that new knowledge gained during the past five years will make it possible greatly to decrease the variability of natural rubber from our knowledge of the influence of the non-rubber constituents on its properties.

Detailed study of the rubber hydrocarbon, the form in which it is present in the tree, and changes which take place after its removal from the tree in tapping, are being linked in a valuable fashion with its behaviour in manufacturing processes.

An extensive survey of the variability of rubber prepared on estates and smallholdings has been carried out and the results of this investigation have been used in the application of a system of technical classification of rubber on lines first suggested by French producers in Indo China early in 1949. At the end of 1953 some 30,000 tons per annum of Malayan produced rubber was being technically classified by the R.R.I. This scheme of technical classification has been extended to the produce of the smaller estates and smallholdings through packing houses. In course of the study of variability and the work on technical classification of normal production, new information has been obtained which can be applied to improve the standard of quality and uniformity of the product by small modifications in plantation methods of preparation.

Good progress has also been made in the study of concentrated latex and in the preparation of special or modified natural rubbers, masterbatches prepared with lignin and carbon black, specially purified natural rubber and the like. Some of these investigations have reached the stage where the next step is pilot plant production and the preparation of large consignments of the new products for manufacturers' evaluation.

Improvements in current practices of preparing crepe rubber by bleaching the yellow colour from latex have been introduced and widely used. From other investigations in this field, including the study of new types of equipment for rubber preparation, study of the design of smokehouses and crepe drying houses, improvements in practice have been introduced.

In cooperation with the B.R.P.R.A. and its development unit, Rubber Technical Developments Ltd, pilot plant production of a new form of natural rubber, cyclised rubber, which offers a promising field of development in the shoe soling industry and possibly for other important uses, has been undertaken on the R.R.I. Experiment Station and demonstrated to prospective users.

This statement is concerned solely with research, no reference is made to other activities of the R.R.I.

CONCLUSION

An attempt is made to compare, as far as such a comparison is possible, the progress made in our own research field with that made by the synthetic industry; an analysis of American manufacturers' preferences, as between natural and standard GR-S synthetic rubber is of interest in this connection.

It is claimed that in part of the field for general usage, synthetic GR-S is preferred to natural rubber. Preferences are illustrated by the following figures:

	1949	*1952*
Percentage of total consumption where GR-S is used in preference to natural rubber	15	38
Percentage of consumption where preferences on technical quality *etc* are equal and price per pound is the chief consideration	50	35
Percentage of consumption where natural rubber is preferred on the basis of its superior quality	35	27

It is, of course, appreciated that there are many reasons why GR-S instead of natural rubber may be used by the American manufacturer. Nevertheless, the figures summarised above indicate that the preference for synthetic rubber is increasing, whilst natural rubber shows some decline in favour despite the fact that it has been sold at a lower price than synthetic.

The present position is that in the field of research on the product the natural rubber industry is in direct competition with the highly organised chemical industry. This industry depends largely for its continued progress on new developments arising from research; it spends 2 to 3 per cent of its annual turnover to this end. We are told, for example, that the United States Government Agency, Reconstruction Finance Corporation (R.F.C.), spent $6.8 millions (U.S.) between July 1951 and June 1952 on research on the product—synthetic rubber. In Malayan equivalents this would mean that our competitors spent three times as much in one year as the Malayan producers have spent in five years for research by the R.R.I.

But the value of research cannot necessarily be measured in terms of dollars spent on it.

With its inherent superiority in some properties natural rubber still maintains a substantial lead over its rivals in a large section of the field of consumption. Natural rubber therefore may be considered to need considerably smaller research and technical services than its competitors. If however, as the figures summarised above indicate, synthetic rubber has captured some 23 per cent of the total field of general consumption of rubber in the U.S.A. in the short space of four years this represents a substantial reward for its investment in research. By the same token, if it is true that the natural rubber industry during the same period lost 8 per cent of total American consumption—or 23 per cent of the market in which four years ago it was preferred as being superior to synthetic—then it may be inferred that the producers' efforts in research on the product have been inadequate.

Tapping — *It is much regretted that the second article of the series on this subject has to be held over until the next issue. It will be entitled 'Tapping Systems'. The delay is occasioned by the necessity to include 'New Class Limits for Technically Classified Rubber', and the new 'Bale Coating Specification', both of which have now come into force.*

Editor

White Latex Crepe

THE QUALITY OF PALE CREPE and sole crepe rubber is judged by the consumer largely on the intensity of its whiteness. In order to produce a good white crepe it is often necessary to remove or neutralise the yellow colouring matter which is naturally present in most latices. This is commonly carried out by fractional coagulation and by the bleaching process recently developed by the R.R.I.

Whole latex crepes can vary in colour from white to deep yellow and a series made from clonal latex at the R.R.I. Experiment Station had the following appearances:

WHITE: AVROS 50, 152; BD 5; Gl 1; PB 23, 86; Pil A44; RRIM 512, 513; Tjir 16

PALE YELLOW: Lun N; Pil B84; RRIM 501, 528, 602

YELLOW: AVROS 49

DEEP YELLOW: PB 25, 186; RRIM 526, 527

The process of fractional coagulation for removing the yellow colouring matter in latex has been in use for many years and consists of coagulating the latex in two stages. The first fraction, which is formed on the addition of insufficient acid for complete coagulation, contains most of the yellow colouring matter present in the latex. The residual latex usually produces a pure white crepe. Method I at the end of this article gives general directions which yield about 15% of the rubber in the first fraction. The size of the fraction varies with the type of latex and can be regulated by the quantities of acid and sodium bisulphite added. Fractional coagulation has the disadvantages that it is time consuming and it results in converting only part of the crop into first quality crepe, the remainder being of a low grade.

The R.R.I. bleaching process, which employs a chemical reagent for bleaching the yellow colouring matter, is less tedious to carry out than fractional coagulation and results in the whole of the crop being converted into first quality pale crepe, provided that care is taken in manufacture. It is sometimes an advantage to combine the chemical process with fractional coagulation. The chemical process has been successfully applied to very yellow latices not normally employed to produce pale crepe rubber, such as PB 186 and PB 25.

Suitable chemical agents for bleaching the yellow colouring matter are RPA 3 and RPA 5 (E.I. du Pont de Nemours & Co Ltd) which are imported into Malaya by Messrs George Blunn & Co Ltd, P.O. Box 199, Kuala Lumpur. In order to disperse these materials in latex they must first be emulsified in water. Originally a 20% emulsion of RPA 3, known as Emulsion A, was marketed by Messrs George Blunn & Co, Ltd, but to reduce transport costs a 'self emulsifying' form of RPA 3 has been developed and is now available as Emulsion A Concentrate.

Bleaching crepe using Emulsion A Concentrate is described at the end of this article. Method II avoids fractional coagulation, whilst Methods III and IV employ both fractional coagulation and the chemical process. The exact amount of concentrate for bleaching must be determined by individual producers to suit their particular latex. It is usually about 6 oz of concentrate per 1,000 lb dry rubber and it is recommended that small scale trials be made with 4, 6, and 8 oz per

1,000 lb. As some bleaching takes place during drying, comparisons must be made on the dried crepe. Softening of the rubber is produced by the presence of excessive amounts of bleaching agent and if any producer requires more than 1 lb concentrate per 1,000 lb rubber then the R.R.I. should be consulted.

A dullness in the crepe is produced by overmachining the coagulum or overheating the crepe. The optimum amount of machining should be about fifteen to twenty passes through the creping battery. Heating above 90°F (32°C) during drying should be avoided and if heated drying sheds are employed the temperature must be carefully controlled. During the laminating procedure as little heat as possible should be applied and cold lamination should be used, if possible.

It has been found that light assists bleaching but too much bright light produces a brownish colour in the crepe. In practice about four or five hours in diffuse daylight are sufficient for bleaching the crepe and this is usually obtained during machining. The drying shed should be as dark as possible.

Emulsion A Concentrate is unstable in the presence of air and stocks should be kept in airtight glass containers (such as the stoppered demijohns in which it is supplied) in a cool, dark place. In view of possible deterioration it is not advisable to carry large stocks and materials should not be stored for more than two months. Contact with metals other than aluminium should be avoided in handling both the concentrate and the diluted emulsion. Glass, earthenware or enamel vessels are preferred. Emulsion A Concentrate is highly concentrated and care must be taken in handling, to avoid burning the skin. In the event of contamination the affected part should be freely washed with soap and water. The wearing of protective goggles is recommended when handling the concentrate.

As the process of bleaching crepe with chemical agents is patented (*B.P. 681,486*), those wishing to use it commercially are required to apply to the Rubber Research Institute for a licence; in most circumstances this will be granted without charge. Where it is required to make use of the process in territories other than Malaya, application should be made through the appropriate organisation for rubber research in that territory.

METHODS FOR FRACTIONATING AND BLEACHING

Method I. Fractional coagulation

a Collect the field latex, sieve and reduce it to a dry rubber content of 2½ lb per gallon.

b Dissolve 1¼ lb sodium bisulphite in 6 gallons of water and add the solution to 100 gallons of the standardised latex with thorough stirring.

c Add 4½ oz acetic acid dissolved in 3 gallons of water per 100 gallons of latex and again stir well. Acetic acid is preferred to formic acid for the first stage since the latter is more fierce in its action. Formic acid may however be used at the rate of 2¾ oz dissolved in 4 gallons of water per 100 gallons of latex.

d After some hours a yellow clot will form in the latex. This must be carefully removed and set aside for machining into yellow crepe.

e Strain the residual latex through a 60 mesh sieve to remove any small yellow clots and coagulate with either 19 oz acetic acid or 11 oz formic acid.

f Machine the coagula in the usual way. The resultant crepe should be very white.

Method II. Bleaching with no fractional coagulation

a Collect the field latex, sieve and reduce it to a dry rubber content of 2 to 2½ lb per gallon in the usual way.

b Add the normal amount of sodium bisulphite as a freshly made 2% aqueous solution (4 to 5 lb sodium bisulphite for each 1,000 lb rubber).

c Weigh out the correct amount of Emulsion A Concentrate required for a given quantity of rubber in latex, emulsify by stirring into four times its volume of water, then add the whole of the emulsion directly to the latex with vigorous stirring. This emulsion should be used on the day of preparation and should never be stored.

d Stir the latex well, add the normal quantity of coagulant and continue stirring until the latex begins to thicken.

e The preparation of the crepe is then completed in the normal way, using the minimum of machining, heating, and exposure to light.

Method III. Fractional coagulation with bleaching of both fractions

Proceed as for Method II, *a*, *b*, and *c*.

Fractional coagulation is then carried out as in Method I, although it has been found possible to reduce the amount of the first fraction to about 10% or less and still produce a good white second fraction, owing to the presence of the bleaching agent.

Fractional coagulation of latex containing the bleaching agent usually produces a whiter crepe than that obtained by using the chemical process alone, and often a whiter one than if the fractionation process were used alone.

Method IV. Fractional coagulation with bleaching of the second fraction only.

Proceed as for Method II, *a* and *b*.

The bulk of the yellow colouring matter is removed by carrying out a fractional coagulation as described in Method I but by separating a smaller first fraction. The remaining latex is then bleached by the procedure outlined in Method II, sections *c*, *d*, and *e*. As most of the yellow colouring matter has already been removed from the latex the quantity of Emulsion A Concentrate required should be less than for Method I. The advantages discussed under Method III also apply to Method IV.

This article supersedes Circular No. 35, also leaflets C/AL 4(34) and C/M 55(50); reprints are available on request.—Editor

CHEMICAL DIVISION

New Class Limits for Technically Classified Rubber

SINCE THE TECHNICAL CLASSIFICATION SCHEME has been developed there have been frequent difficulties in classifying the production of certain estates and packing houses, even though the variation in physical properties of the bales of rubber has not been large. The difficulty has been due to the mean level of properties being on or near the borderline between two of the three classes. Thus about half the bales in a certain consignment might be in the Yellow Circle class and the other half in the Blue Circle class; in consequence the consignment could not be classified. Some relief was obtained on estates by the employment of methods, whereby the estate would make a deliberate attempt to change the mean level of physical properties by a modification to the normal preparation or the addition of a very small quantity of an innocuous chemical. It was impracticable to apply such techniques to smallholder's rubber in godowns and an alternative solution was required. At the same time there were other minor faults connected with the accuracy of the classification and a scheme was developed which would not only overcome the borderline problem, described above, but would also increase the accuracy with which consignments of rubber would be classified. The original scheme is illustrated by *Figure 1*. The zones of uncertain classification in the vicinity of the borderlines indicate the areas within which the mean value of the physical properties of a uniform consignment might fall and yet not be satisfactorily classified. The new scheme can be described as one with overlapping classes and is shown in *Figure 2*.

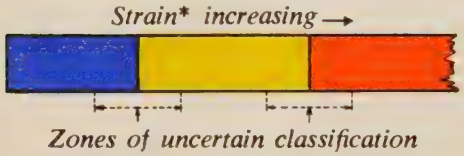


Figure 1. The old class limits.

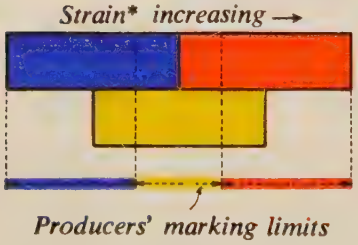


Figure 2. The new class limits.

From a comparison of the *Figures 1* and *2* it will be seen that the range of physical properties has been reduced, in practice it is estimated that this will exclude a small proportion of the total production of rubbers which should be counterbalanced by the increased amount of rubber classified in packing houses and remilling factories. Also the

* *Strain is the elongation of a strip of vulcanised rubber under a specified stress.*

level changing procedures will be largely unnecessary, unless some producers wish to change the technical classification of their rubber to meet special orders.

Classification by the new system implies that some estates which have previously been classified Yellow Circle will in future be classified Red Circle or Blue Circle; about 20% of the estates cooperating with the R.R.I. of Malaya will be affected. All producers whose rubber needs reclassification under the new scheme have been notified.

There are several advantages associated with the new scheme, from the point of view of the manufacturer. Firstly, the rubbers with extreme properties will be excluded from the classification scheme. Secondly, the rubber within any one class will be substantially more uniform due to the introduction of marking limits for the producers. Thirdly, the new Red Circle and Blue Circle classes have slightly different properties from the original classes, but will be more readily available than hitherto for those consumers who find specific uses for them. Fourthly, the average misclassification brought about by possible errors in testing and sampling will be reduced to a negligible amount.

With the introduction of the new class limits a registered symbol will be superimposed on the present circle design, the intention being to restrict the use of the mark to authorised producers. Although no examples of intentional unauthorised marking have been encountered in Malaya, many producers were disturbed at the possibility of the illegal use of the circle symbol and of confusion with other bale marks. The precise form of the symbol has not yet been made final, but the design will probably be a monogram incorporating the letters T and C. New stencils will be provided to all estates, packing houses and remilling organisations cooperating with the R.R.I. of Malaya, for use on lots of bales from which samples have been tested and found of satisfactory uniformity.

A reprint of this article may be obtained on request. Reference may be made to the article 'Technical Classification of Rubber: Estate Procedure' in P.B. 2, also to the note on page 28 of P.B. 5 explaining a simplification of the classification.—Editor

CHEMICAL DIVISION

R. R. I. News

A method for blending remilled rubber is being developed which it is hoped will be in use shortly.

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A preliminary note on the 'Uses of 2,4,5-T on Hevea' appeared as Communication 288 of the *Journal of the R.R.I. of Malaya.* This substance shows promise as defoliant, weedkiller, yield stimulant and tree poison, according to the mode of application.

o

Scrambling of sheet is more effective than latex bulking or factory control, in producing rubber bales of similar strain values.

Correspondence

The Editor of PLANTERS' BULLETIN *invites letters of general interest for publication in this column. Comment and queries arising from articles recently published will be welcome. The name and address of the writer must be given in full, but may be withheld from publication if desirable.*

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MEDICINAL PLANTS

In September 1950, we laid down germination beds for various species of *Strophanthus* with a view to testing development under Malayan conditions. Owing to damage caused by slugs and chafers only about 50% successful germination was recorded. The seedlings were planted in ordinary 4in × 9in planting baskets.

Fruit of Strophanthus sarmentosus

In December 1950 the plants were interplanted between young rubber of the same age. The spacing of the rubber trees is 15ft × 15ft and the *Strophanthus* were spaced 6ft × 6ft in two rows in the middle of each avenue of the rubber trees.

Fruit of Strophanthus ecaudatus

The *Strophanthus* is a vigorous grower and its long slender shoots have almost covered the entire area. It has already attained a height of about 8 feet by twining around its own shoots. Pruning is necessary in order to prevent it from strangling the young rubber trees. Thinning out will soon become necessary and a wider spacing of the plants would have been preferable from the beginning.

Flowers of Strophanthus hispidus

Being a climber, the *Strophanthus* is unsuitable for cultivation with rubber and it may become necessary to provide poles as the

shade from the rubber grows dense. In Africa, where it is grown on a commercial scale, no host trees or poles are provided for the plants to climb to the light.

Our plants have so far developed satisfactorily under ordinary estate conditions with the exception of one variety, *S.amboensis;* the other seven species grown here are blossoming fairly well. Two of these, *S.sarmentosus* and *S.ecaudatus*, are now setting fruits as shown in the pictures.

Our experiments with *Strophanthus* are confined to the following species: *S.courmontii, S.hispidus, S.amboensis, S.grandiflorus, S.hypoleucus, S.ecaudatus, S.intermedius and S.sarmentosus.*

The cortisone extracted from the seeds of the *Strophanthus*—for which it is generally grown—may perhaps be more readily available in some of the species of the Dioscoreaceae endemic to Malaya. *Dioscorea mexicana,* not endemic to Malaya, is under trial here and a few tubers of this plant have just been transplanted to another site, subsequent to its previous poor development on laterite soil.

Mount Austin (Johore)
Rubber Estates Ltd
O.V. Hansen
Manager

Little appears to be known about Strophanthus, and it is not considered suitable for cultivation with rubber. S. sarmentosus has recently been found to lack sarmentogenin. Cortisone from any substance of vegetable origin would appear to be expensive, but might provide material for research purposes, until a cheaper substitute is discovered.
—Editor

Economics of Replanting

It has been suggested that, in the example given under this heading in 'Yield Maintenance of Mature Rubber Trees' (P B 8 page 96) the actual figures quoted could not be produced on a typical average estate. In particular, reference was made to the estimated cost of replanting. Replanting costs vary appreciably between different estates, depending on local conditions and on what items of maintenance and general charges are included. The cost of replanting quoted in the article was not obtained by examining a wide range of recent figures from a representative selection of estates, and is lower than the figures now available for cost of replanting.

Although the main argument outlined in this section of the article is not affected, it would have been more appropriate, in view of wide divergence between costs on individual estates, to have summed up the argument in algebraic notation, and left each estate to substitute its own figures throughout the formula.

Stimulation of Yield

A brief account of our work on yield stimulation was given in P B 7. A considerable amount of data has been collected in the course of this work and a full account of our researches on the subject from 1940 onwards is now being prepared by Dr E.D.C Baptist and Ir P. de Jonge for publication in the *Journal of the R.R.I. of Malaya,* under the title of 'Stimulation of Yield of Hevea Brasiliensis'.

Root Disease

FOR MOST PRACTICAL PURPOSES it is sufficient to treat the root diseases of rubber as one problem although a complete list of root parasites in Malaya would include six species of fungi, three of which are important. It will be appropriate to give a description of these, to show how it comes about that they can be treated together and what differences are noteworthy. The three minor root diseases will be dealt with separately; they are *Sphærostilbe repens* (the cause of stinking root rot), a species of *Poria*, and *Ustulina zonata*. The last named is more familiar as the cause of collar and stem rot.

The most important is white root disease caused by *Fomes lignosus*, in French literature called *Leptoporus lignosus*, in Dutch accounts *Rigidoporus microporus*. *Ganoderma pseudoferreum*, at one time called *Fomes pseudoferreus*, is the cause of red root disease; brown root disease is brought about by *Fomes noxius*, sometimes regarded as the same as *F. lamaensis*. *F. noxius* is certainly the least significant of the three. Whereas *F. lignosus* is most conspicuous on young rubber and on coastal alluvial soils. *Ganoderma* is more a disease of old rubber on inland soils.

RECOGNITION

Healthy rubber roots have a smooth and almost flesh coloured surface on which the lenticels (the breathing pores) are seen as small black specks. Some colour may be absorbed from the surrounding soil. Little corky bark is produced unless the root is exposed to light and air. A diseased root becomes externally rough and takes the colour of the infecting fungus. Roots killed by other agencies decay without their superficial appearance being markedly changed.

Recognition of the three major parasites is not a simple matter of observing the colour of infected roots, as the names imply, for their appearance changes so much with age that the symptoms overlap. There are three things to look for in identifying the parasites: the fruit body, which is a leathery or woody bracket on the part of the decaying wood above ground, showing concentric growth zones on its upper surface; secondly the rhizomorph, which is composed of fused fungal mycelium forming root like strands or a skin; lastly, the appearance and texture of the rotted wood. The first feature is most useful for *F. lignosus*, of which the distinctively coloured fruit body is commonly seen. The *Ganoderma* fruit body is quite different but it resembles that of a harmless species often found on rotting wood. The fructification of *F. noxius* is hardly of value for recognition as it is seldom seen. The descriptions which follow will enable anyone to identify the major root diseases of rubber trees but they cannot be relied upon to identify a fungus growing on a dead stump.

WHITE ROOT DISEASE (*Fomes lignosus*) — Rhizomorphs will be seen growing along and firmly attached to infected roots. Typically they are white and flat at the growing end. Sometimes they produce only a few branches, sometimes they are highly divided forming a fine network or a sort of white skin, though this is rare. As they grow old the rhizomorphs become rounded and may assume an orange red colour. The wood of a root which is newly killed is brown and hard, sometimes with a greyish tinge, and is darker than the same stage with the

other two parasites. The advanced rot is white or cream and is usually firm, though in wet soils the rotted roots may be jelly like. Fruit bodies may be found at the collars of infected trees and on large exposed roots or stumps in an advanced stage of decay, especially during wet weather. The brackets are often in many tiers, their upper surfaces orange yellow and lower surfaces orange, red or brownish. When cut across, an upper white layer and a lower reddish brown layer can be distinguished.

Some species of harmless fungi produce white rhizomorphs and may therefore be confused with *F. lignosus*. The identity of the disease is established by the association of white rhizomorphs with the parasitic habit, which can be determined by cutting into the bark beneath the fungal growth some distance behind its growing end. If the bark is dead then the fungus must be a parasite. Rhizomorphs of non-parasitic white fungi are usually loosely attached to the roots.

RED ROOT DISEASE (*Ganoderma pseudoferreum*) – Infected roots are covered with a red skin of mycelium to which soil adheres. The red colour may not be apparent in a fresh specimen until it is washed. The growing margin of the fungus is usually creamy white; the characteristic red colour is formed only as the mycelium becomes old, that is, some inches behind the limit of advance. The inner surface of the fungal skin is a dirty white. In the early stages the rot produced by *Ganoderma* is pale brown and hard; in the late stages it is pale buff, wet and spongy unless the soil is dry, but then it is unlike the rot produced by the other two parasites in that the annular layers of the wood separate easily. Fruit bodies are hard with dark red wrinkled upper surfaces, ash white below. The margin is also picked out in white.

BROWN ROOT DISEASE (*Fomes noxius*) – Like *Ganoderma, F. noxius* forms a continuous fungal skin over infected roots. Its colour is tawny brown becoming almost black with age. Diseased roots develop a very rough and irregular surface through a thick layer of soil adhering to them. On washing the soil away patches of brown mycelium can be seen. In the early stages the rot is pale brown; later brown zigzag lines appear in the wood which remains firm. When the rot is considerably advanced it becomes friable, light and dry, permeated with sheets of fungal material forming a honeycomb structure. If a root at this stage is crushed it breaks up into irregular fragments. The cells of the honeycomb may be hollow or filled with loose brown mycelium. At a fairly advanced stage a brown network of lines can be seen also on the surface of the wood beneath the bark. The fruit body is a very hard dark brown and rather small bracket, dark grey on the underside.

Ustulina zonata may be confused with *F. noxius* by an inexperienced observer, though infected roots do not possess the brown skin nor will soil adhere to them. Further, the rotted wood is a uniform light brown brittle mass, in section showing a network of black lines in the outer layers in contrast to the brown lines of *F. noxius* which extend right through the specimen.

SPREAD OF THE DISEASE

The factor that makes for the three diseases being treated as essentially one problem is the formation of rhizomorphs by which they spread. They cannot penetrate soil but the strands of *F. lignosus* can travel for a limited distance over inert surfaces, as well as on roots and other

vegetable matter. A healthy tree becomes infected by contagion when one of its roots comes into contact with a source of disease. Penetration is by fungal strands from the rhizomorph, killing and feeding on the root tissues.

Differences between the three fungi are, from a practical point of view, of two kinds — one a matter of degree, the other of function. The first difference concerns the rate of spread of the rhizomorphs. The strands of *F. lignosus* advance much faster than the mycelial web of each of the others, and may extend a foot or two ahead of the zone of penetration. *F. noxius* is the slowest; the external mycelium may extend no further than the rotted part of the root. The second difference alluded to concerns the spores produced by the fruit bodies. Here we are on less firm ground. While other views that have been held are still not finally disproved, there is evidence to support the belief that both the *Fomes* species are spread by spores which can infect moribund roots as well as injuries on the trunk or branches. There is no indication that they can start a root infection of an intact and healthy tree, but when it is felled its stump may later become infected by this means.

ROOT DISEASE CONTROL

The application of control measures is complicated by economic factors which cannot be ignored in a discussion of the subject, intangible and unstable as they are. There is the further complication that while in times of financial stress there is abundant labour, when money is freely available, conversely, labour is not. Under these conditions it is frequently impossible to follow what may be regarded as the most effective treatment. In addition there is a considerable body of planting opinion that root disease control is always too costly to be economic; some even doubt its effectiveness. The latter view perhaps has its origin among planters who, on returning after the war to estates that had been negelected for four years, were surprised to find how slight had been the ravages of pests and diseases on which large sums had previously been spent every year. The observation was general. The facts of the matter cannot now be established but two factors may have operated to exaggerate the view that all pest and disease work was wasted. The first is psychological — anticipating heavy losses the planter may have been more impressed by what had survived than by what had gone. The second is that the high standard of pre-war control work may have made it possible for the rubber to survive a long period of neglect. When the choice is between a certain loss, in the sense of expenditure on root disease control, against a problematic loss through a reduction in stand, it is understandable that some will prefer the latter. It is a short term against a long term view; though it must be agreed that money spent on root disease in old rubber within sight of the end of its productive life is unlikely to be recovered in the crop.

Factors concerned with planting practice also have a large bearing on the root disease problem. Rubber planted on land which has long carried some unsusceptible crop will have little or no disease; on the other hand in new plantings from jungle or in replanting areas where disease has been left untreated a heavy incidence may be expected. Planting distances will have a considerable influence on the rate of spread: in a nearly square planting the roots will more quickly explore

the whole of the area, encountering such sources as exist, than they would in a hedge or avenue planting. The soil type and the nature of the covers have a profound effect. Perhaps most important of all is the method of clearing, whether from rubber or jungle. At worst a young planting may become almost a total loss if no attention is paid to root disease in an area where sources of infection are numerous and conditions are otherwise favourable for the fungi.

The following considerations must be the basis in discussing ways of tackling root disease: (*i*) that healthy trees become infected when their roots make contact with sources in the soil, the disease spreading in the absence of treatment to form ever widening patches; (*ii*) that the roots of diseased trees will remain infected for many years, until they have completely rotted away; (*iii*) that the stump of a healthy tree is liable, after felling, to become invaded by *F. lignosus*, or by *F. noxius*, which can infect other woody parts as well.

We may consider first the ideal solution, regarding rubber cultivation as being in continuous rotation and starting — arbitrarily — at the young replanting. The presence of disease is recognised by rounds of collar inspection as described in *Planters' Bulletin* 4. Usually the infection will have travelled along a lateral root; by making sufficiently frequent examinations the rhizomorphs are detected before penetration of the fungus has extended to the collar. By severing the whole of the penetrated part, scraping off the advancing rhizomorph and painting the root surface with a fungicide, the tree is saved. The diseased lateral is then traced back to the source from which it became infected. It may be a stump or root fragment, which is removed and burned to prevent it infecting others. Some trees will be lost through an infection picked up by the tap root and some because the disease has advanced too far before it is discovered. The method, which works best with *F. lignosus* because the rhizomorphs advance well beyond the rotted part of the root, will bring a replanting through with no more loss than can easily be accepted. Some thinning is anyway desirable as trees grow older. When the time comes to replant there will be so few diseased trees that their eradication will present no problem. The rest of the stand can be poisoned, or felled and the stumps poisoned, unless mechanical clearing were to be preferred for other reasons. The potentially dangerous root systems would by the first two procedures be rendered inocuous by killing them quickly, exposing the wood to invasion by harmless saprophytes to the exclusion of the parasites. The third method would need to be followed by removal and burning of the fragments. The location and eradication of sources of infection is justified in the long run, but it should be stressed that the good work done in controlling root disease in a mature stand may be lost if at replanting the stumps are left unpoisoned in the ground, risking the re-introduction of *Fomes* infections to the area.

A method of poisoning standing trees by ringbarking and painting with a sodium arsenite paste was described in *Planters' Bulletin* 1. Procedures to adopt in poisoning stumps of felled trees were discussed in Circular No. 36, where it was concluded from certain preliminary observations that the ringbarking technique is preferred. Tree and stump poisoning are about equally effective from the point of view of disease control in that both kill the bulk of the roots in six months to a year.

The method for stumps is as follows. The bark is removed from the top eight inches or so as soon as possible after felling by striking it with the back of an axe and peeling it off. The exposed wood is at once painted with a solution containing five pounds of sodium arsenite in a gallon of water, thickened with six ounces of tapioca flour. The flour is first made into a smooth paste with a minimum of cold water; boiling water is added with stirring until the resulting glutinous mass is thin enough to run and it is then stirred into the sodium arsenite solution. Time will be saved in dissolving the poison by using hot water. The paste can conveniently be applied with a large flat brush, one gallon being sufficient for about sixty stumps. As a guide to the labour involved, roughly fortyfive stumps can be treated per man-day.

Some of the above advice may at certain times and in certain places be regarded as an unattainable counsel of perfection. Though the aim must be the same, various expedients may be resorted to on grounds of economy, sometimes with advantage. Thus, where there is no prospect of replanting an area of old rubber, eradication of root disease may well be regarded as uneconomic; the rate of spread is slow and the trees may not be worth spending money on. In an area which is to be tapped for a prolonged period, however, isolation trenching round disease patches may be the best solution. A trench to be effective must enclose all the infected material; if as originally sited it cuts through diseased roots, an extension must be made at this point. The purpose of the trench is to sever all root contact. In time the root systems will re-unite by growing in from both sides; it is therefore necessary to interrupt the connection again every year or so. To avoid the necessity of digging the trench deeper every time it is best to refill it as soon as it is completed, so that re-opening to the same depth is all that is needed. Isolation trenches dug once and then neglected will certainly fail to achieve their purpose.

Root disease in areas to be replanted will mostly lie on the margins of well defined patches; in their centres the infection will have died out long ago. It is not unusual or surprising to see in very old rubber large trees that were once volunteer seedlings growing in the open space after the original stand had gone. This does not indicate resistance to infection but that the root parasite had exhausted its reserves and died out. To eradicate diseased trees prior to replanting it is therefore possible to confine attention to what may be only a small part of the stand. Attacked trees can be winched or jacked over, bringing out part of their root systems; the rest should be dug out and all diseased roots burned. An alternative procedure — the leaving of diseased trees in the ground — may sometimes be justified notwithstanding that the method appears unsound. The question is whether the stump of a diseased tree, which will become a source of infection sooner or later, can more easily be removed while the tree is intact or after it has been allowed to rot for as long as it can be left in position without infecting the young stand. The answer will depend on the nature of the soil, covers and on planting distances. A dense growth of legume creeper will hasten decay. The method is more likely to succeed in hedge plantings but even then there is good reason to remove diseased stumps from near the tree rows. The procedure is the only practicable one in jungle clearings, for the removal of a large jungle stump is not to be contemplated.

It may be argued that collar inspection as a first step in carrying out root disease control in young rubber is unnecessary provided that a close watch is kept for indications in the foliage. There is some experimental support for the view. It should be borne in mind, however, that trees detected in this way will be beyond saving — they can only be removed and burned — and that the trees thus thinned out will often be the best grown, for they have the widest spread root system and in consequence the best chance of encountering infective sources. The method has something to recommend it even though the cost of collar inspection in immature rubber is usually the least part of expenditure on control, varying from one to three man-days per acre depending on the soil and the age of the trees. A compromise is probably the best solution, collar inspections being carried out for a year or two while the trees are small enough to be quickly invaded and killed, followed by more frequent rounds of inspection of the foliage.

The eradication of sources of infection in young rubber is an extension of the clearing of diseased trees in preparation for replanting. An immediate and perhaps lasting economy can be effected by cutting off the lateral roots from diseased stumps — a relatively easy operation — leaving the bole to rot. Unless it is near the young trees it will be much decayed before another infection occurs from it.

In conclusion reference must be made to an important but unexplained effect of cultivating legume covers. Experiments have shown an incidence on the young rubber where bush or creeping covers were planted of only half that in comparable clean clearings. The result is somewhat surprising since the covers were themselves susceptible to the same diseases. Two explanations of this effect have been proposed. The first supposes the rhizomorphs of the parasites to dissipate their reserves in spreading over the dense tangle of cover crop roots. The second attributes the effect to changes in the microflora of the soil under dense cover, encouraging the multiplication of fungi or bacteria that are antagonistic to the parasites. Though the question remains unresolved the practical point is that the cultivation of legumes has a most desirable effect. Certain bush covers, however, must be eradicated when diseased just as the rubber trees; although they serve as useful indicators of foci of infection, the cost of dealing with them argues against their use where root disease is severe. Creeping covers are generally to be preferred as they can bear the disease without being materially weakened, and they have the extra merit already alluded to of enveloping and hastening the decay of stumps and surface timber.

Summarising the observations on control measures it may be said that four operations are involved: (*i*) preplanting treatment, to dispose of infective sources and to neutralize or remove potential ones; (*ii*) inspection of the young stand; (*iii*) treatment of diseased trees, and (*iv*) tracing out and isolating, limiting or eradicating sources of infection. The ways in which these objectives may be attained and certain procedures by which advantage can be taken of natural processes of decay have been discussed.

A reprint of this article may be obtained on request. Circular No. 36 is no longer available--Editor.

PATHOLOGICAL DIVISION

Bale Coating Specifications

THE CONTINUED ENDEAVOUR OF PRODUCERS and consumers to improve the standard of packing of natural rubber has led to a recent revision of the green booklet 'Type Descriptions and Packing Specifications for Natural Rubber' adopted by the Rubber Manufacturers Association Inc, endorsed by the Rubber Trade Association of New York, and effective as from 1 July 1952. The amendment dated 1 September 1953 contains certain clarifying changes in the packing specifications for Thick Pale Crepes, Thin Pale Crepe and Estate Brown Thin Crepes.

Substantial amendment has been made to Sections 6 and 7 of the packing specifications pertaining to 'Talc Specifications' and 'Bale Coating Solution'. The purpose of the amendments of these two sections is threefold:

1. The inclusion of cheaper workable white powders in the list of acceptable powders, of sufficient fineness that they will impart a complete lack of adhesion when two such coated surfaces are compressed together and will meet the dispersion requirements.
2. To prohibit the use of any binder except natural rubber in the bale coating solution.
3. To establish specific tests to determine conformance or non-conformance with the specifications. Such tests have been defined so that they can be conducted by qualified laboratories.

Sections 6 and 7, as amended, are given in full below and supersede the previous specifications which were reprinted in the article 'Bare Back Baling of Sheet Rubber' (P.B. 7 pages 81-3). With this exception all points made in the previous article are still pertinent.

Section 6. Powder Specifications

The powders considered as acceptable for use in bale coating formulations shall be white and water insoluble inorganic substances.

They must meet the following minimum specifications when washed through the following sieves:

100% penetration through a standard U.S. Sieve No. 100
93% „ „ „ „ „ „ No. 325

The screens used for testing shall conform to the U.S. Standard Sieve Series Equivalents, as specified by the American Society for Testing Materials, A.S.T.M. designation E-11-39.

The specific gravity of the powders used may range from 2.60 to 3.00.

They must disperse uniformly and without agglomeration upon milling.

The following types, provided they are white, shall be considered as acceptable:

1. Mineral powders consisting mainly of hydrous magnesium silicate. These are generally known as talc, talcum, soapstone, magnesium silicate, steatite, fibrous talc and French Chalk.
2. Mineral powders consisting mainly of hydrous aluminum silicate. These are generally known as kaolin, Dixie Clay, Catalpo Clay, China Clay, etc.

3 Mineral or precipitated powders consisting mainly of calcium carbonate. These are generally known as whiting chalk, Paris or English White.

4 Any combination of powders listed above is permissible.

5 Mineral powders containing calcium sulphate are not acceptable. These are generally known as gypsum or Plaster of Paris.

Section 7. Bale Coating Solution

A. Natural Rubber Solution Binder

½ lb. clean natural rubber

1 U.S. gal. solvent (specified below)

Allow the above mixture to soak for 24 hours, then add

½ U.S. gal. solvent, and stir uniformly mixed.

The solvent that must be used (previously specified in R.M.A. packing specifications as mineral turpentine) is a hydrocarbon of petroleum distillate having a distillation range of 290°F to 410°F. The specific gravity at 60°F ranges from 0.766 to 0.830. The flash point in a closed cup ranges from 90°F to 105°F.

Known trade names of this material as distributed in Southeast Asia are as follows:

Shell Oil — "Mineral Turpentine"

Standard Vacuum Oil — "Varnolene"

B. Coating Mixture

4 U.S. gal. solvent

16 lbs. natural rubber solution

Up to 48 lbs. fine white powder as specified in Section 6 (or reduced amount depending on unit weight per volume). (Enough for coating approximately 75 bales.)

The coating after drying shall impart a complete lack of adhesion when two treated rubber surfaces are compressed against each other.

The following ingredients are unsatisfactory for use either as fillers or binding materials and their use is not permitted:

(a) Starch materials

(b) Glue materials

(c) Resin materials

Experience has shown that powders available for sale in the rubber producing areas vary as to their weight per unit volume. If lighter weight varieties of powder are used, strict adherence to the above formula may result in a solution too heavy to be practicable. In these cases, instead of using the specific amounts of powder by weight shown in the above formula, it may be necessary to reduce the quantity of powder with the objective of producing a bale coating solution which will flow on readily and remain bonded to the rubber after drying.

The Indonesian Rubber Research Institute has reported satisfactory results by increasing the proportion of rubber to solvent in the natural rubber solution from the specified ratio of ½ lb. rubber to 1½ U.S. gal. total solvent to ½ lb. rubber to 1 U.S. gal. total solvent and reducing the amount of talc in the coating mixture to approximately 27 lbs.

Section 7(a) Conformance or Non-Conformance Procedures

A. Specific Testing Procedures

1 Milling test — physical

Actual dispersing test using sample of bale surface covered with the coating in question. Care should be taken to select a part of the wrapper sheet that is free from adhering dirt.

Method

(a) Break 400 — 450 grams of the rubber down on a warm laboratory mill with an opening of .055 inches at approximately 160°F for 4 minutes.

(b) Cut each way 6 times and sheet rubber off at an approximate thickness of 0.090 inches.

(c) Examine visually with the naked eye for dispersion of coating material.

Note: The R.M.A. coating will be uniformly dispersed and without agglomeration while non-acceptable coatings will show undispersed powders.

2 Tests for talc, clay, whiting and gypsum

(a) Talc and clay are insoluble in dilute hydrochloric acid.

(b) One may be differentiated from the other by microscopic examination.

(c) Whiting is dissolved by dilute hydrochloric acid, giving off effervescent bubbles.

(d) Calcium sulphate (gypsum) is partially dissolved by dilute hydrochloric acid. Filter off insoluble material and test filtrate with barium chloride solution for sulphates.

3 Starch Test

To determine if starch, tapioca, or flour is used as a binder, scrape off some of the coating material, boil in water, cool, and add iodine solution. If any of these are present, a blue color will develop. The iodine test solution can be made by diluting ordinary tincture of iodine with some water.

4 Glue Test

To determine if glue is used as a binder, remove some of the coating, burn and observe the odor. If the odor is that of wool, burnt bone or burnt meat, glue is present.

5 Resin Test

No available test is known as yet.

B. Solution Test — Laboratory Analysis

This standard procedure is available when disputes on conformance have not been settled by the specific tests provided in paragraph A above. Since these tests are designed to determine conformance or non-conformance of the bale coating, only, all samples should be taken in such a way as to eliminate any material or materials foreign to the bale coating itself.

1 Abstract

Approximately 2 grams of bale coating material is digested in solvent naphtha for two hours. The mixture is strained through a 325 mesh screen which retains any non-conformance substances for a quantitative measurement.

It is to be noted that these new Specifications are effective from 1 December 1953. They should not affect any packers who have been using bale coating solutions meeting the previous specifications but in the main they allow the use of local Malayan materials for bale coating powders and render the detection of non-conforming powders more easy. In particular the Malayan materials now allowed are calcium magnesium carbonate, which occurs in the many limestone outcrops, and kaolin which as China clay is also widely distributed. There are many suppliers of these materials and care should be taken to establish that the material supplied is sufficiently fine to pass the sieve specification. A large number of the samples of China clay and calcium magnesium carbonate have been found to be too coarse. In addition China clay is often markedly off white. Our opinion is still that talc (magnesium silicate) is the best bale coating powder, followed by calcium carbonates and finally kaolin (China clay). Gypsum or plaster of Paris is mentioned in the new specifications as unacceptable, it is unlikely on cost grounds alone that this material would be offered for sale in Malaya.

It is emphasised again that a rubber gum based bale coating is the best and only coating that should be used. Starch, glue and resin materials are not allowed since they give rise to coatings which are indispersible on milling. The new Section 7(a) on conformance and non-conformance procedures requires comment. The milling test is one which will show up any poor dispersion of coatings. The R.M.A. are satisfied that specified bale coatings will pass the test and experiments are in hand at the R.R.I. to compare the dispersions obtained with various coatings. The identification of various powders and starch in bale coatings is similar to the methods already described in *Planters' Bulletin.*

The solution test is to be used if conformance is not settled by the other tests and it appears to us to be subject to a weakness, in that the basis of the test can give rise to errors. Even if it is possible to take a completely dirt free sample from the surface of a bale transported several thousand miles, contamination with powder off specification could have occurred during shipment, or small particle size powder could have been lost preferentially from the bale coating. We think that examination of trial shipments should have been made before including this test as a conformance test. Should any of these contaminations or losses occur the effect would be that a powder of borderline conformance would pass over to non-conformance and the shipment would be liable to penalty. Nevertheless since the test is laid down we advise packers to use a powder at least as fine as 95 per cent passing through a U.S. Sieve No. 325 instead of the allowable minimum of 93 per cent. This should avoid all possibility of claims due to non-conformance to the sieve specification. Meanwhile the R.R.I. are conducting experiments to examine the ramifications of this test.

Despite these criticisms the conception of the new specifications is more satisfactory than that of the old ones and they allow the conscientious packer to use a cheaper bale coating solution while satisfying the consumers' requirements. At the same time the consumer is now protected from careless packers.

Bale Coating Specifications

A reprint of this article, which amends that entitled 'Bare Back Baling of Sheet Rubber' (P B 7 page 78), is available on request. A copy of Amendment I to the R.M.A. green booklet may also be obtained from us.—Editor.

CHEMICAL DIVISION

Separation of Latex into Fractions

Latex is not a homogeneous liquid but is composed of four distinct components. Three of these components are very small particles suspended in the fourth, which is a solution of proteins, sugars and salts, known as serum. Most of the particles are rubber. The others are stable yellow particles discovered in 1929 by Frey-Wyssling, and unstable, colourless or slightly yellow globules discovered in 1948 by Dutch workers in Indonesia. The latter are called 'lutoids'. These lutoids and the Frey-Wyssling particles are mainly present in the first fraction removed by fractional coagulation during the preparation of crepe.

For the first time, these four phases have been separated from one another by centrifuging at a very high speed. The fractions are described by A.S. Cook and B.C. Sekhar in Communication 286 of the RRI Journal. It is expected that high speed separation will enable our chemists to investigate much more fully the chemical nature of latex.

Clone PR 107 (LCB 510)

A good deal of interest is being shown in this clone for use in replantings. It is reputed for its good bark characters and its resistance to wind damage but we are still uncertain of its value for large scale planting as its performance seems to vary in different parts of the country.

We ask any of our readers who have the clone in tapping on their estate to let us have their opinion of the clone as regards both secondary characters and yield capacity.

R. R. I. News

Valuable information on spacing formation may be expected from an experiment comparing three hedge row spacings of 50, 65 and 80 feet, and planting distances along the rows to give three planting densities of about 150, 195 and 245 trees per acre, with avenue planting and rectangular giving 180 trees per acre. Budding was carried out last year with clones RRIM 501, 513, 527 and LCB 1320.

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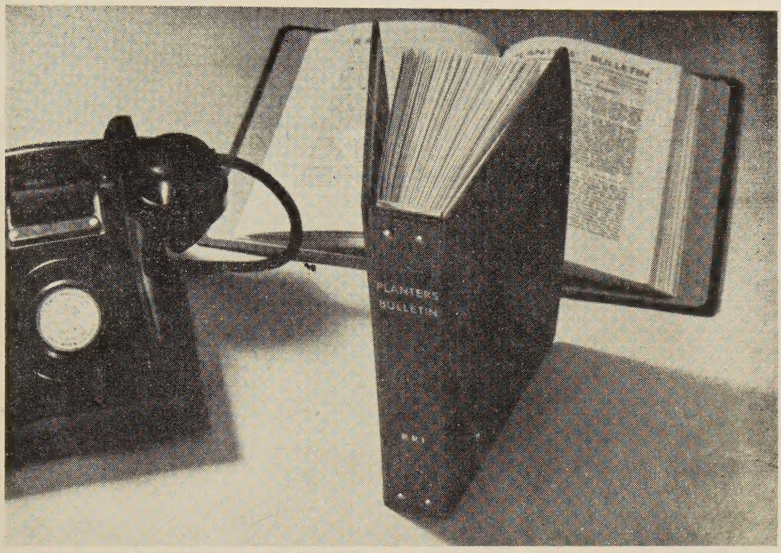
Results for the first four years of continuous tapping in pre-war experimental plantings on estates show little difference in the yield performance of seedlings grown from mixed seed of the Prang Besar Isolation Gardens C, D and E and of selfed seedlings of clone Tjir 1. The best yields have been obtained from clones RRIM 501 and 513 which appear to be of equal merit.

Keep your P B s neat!



The special P B binding case shown above is now available at $4.50, post free in Malaya. It is bound in green leathercloth, and titled in gold.

Sites for Aerial Spraying Trials with Defoliants

The Pathological Division requires to find suitable sites for further work on the aerial spraying project described in the *Editorial* of P B 8. The choice of site is restricted in many ways: the rubber must be abandoned or scheduled for early replanting; the area must be not less than 100 acres in a compact block, preferably with clearly defined boundaries, and there must be access by road. Although the accuracy with which swathes of the defoliant can be applied makes it possible to avoid contamination of adjacent areas. it is convenient to have at least one boundary 'safe' from this point of view — jungle, waste land or old rubber.

Sites are difficult to find, and the Pathological Division would appreciate being informed of suitable areas on the property of any Company whose Board would be willing to cooperate in this vital investigation. Cooperation entails little or no demand on estate resources as the unit engaged on the work is essentially selfcontained. Rubber scheduled for replanting would be sprayed during the months immediately preceding clearing; May, June and July being most suitable. Abandoned rubber would be preferred because the trials could then take place at any time and observations could be continued over a prolonged period.

OUR COVER ILLUSTRATION IS A PURE CULTURE OF FOMES LIGNOSUS WITH RHIZOMORPHS SPREADING OVER THE GLASS

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